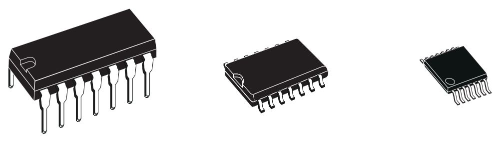
# M74HCT14

## HEX SCHMITT INVERTER

- HIGH SPEED:
  $t_{PD}$ = 19ns (TYP.) at $V_{CC}$ = 4.5V
- LOW POWER DISSIPATION:
  $I_{CC}$ = 1µA(MAX.) at $T_A$=25°C
- HIGH NOISE IMMUNITY :
  $V_H$ = 0.7V (TYP) at $V_{cc}$ = 4.5V
- BALANCED PROPAGATION DELAYS:
  $t_{PLH} \cong t_{PHL}$
- SYMMETRICAL OUTPUT IMPEDANCE:
  $|I_{OH}| = I_{OL}$ = 4mA (MIN)
- PIN AND FUNCTION COMPATIBLE WITH 74 SERIES 14




### DESCRIPTION

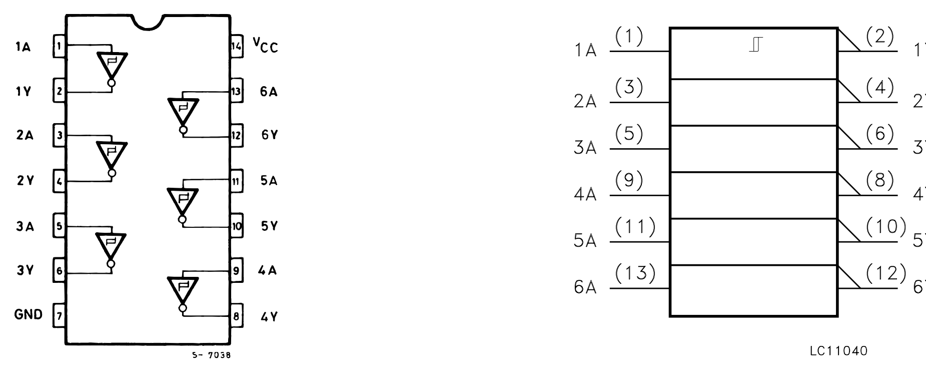
The M74HCT14 is an high speed CMOS HEX SCHMITT INVERTER fabricated with silicon gate $C^2$MOS technology.
Pin configuration and function are the same as those of the M74HCT04 but all inputs have 0.7 V hysteresis level. This together with its schmitt trigger function allows it to be used on line receiver with slow rise/fall input signals.

### ORDER CODES

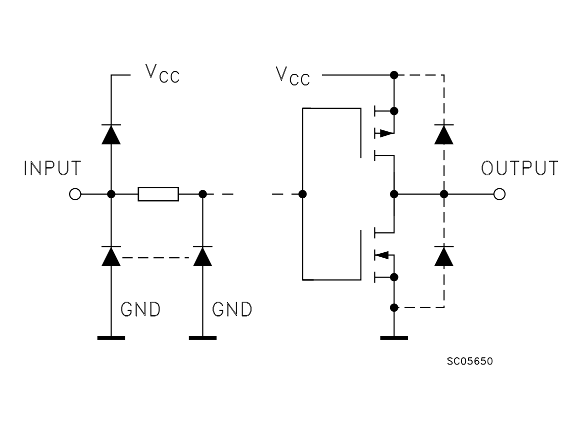
| PACKAGE | TUBE | T & R |
|---|---|---|
| DIP | M74HCT14B1R | |
| SOP | M74HCT14M1R | M74HCT14RM13TR |
| TSSOP | | M74HCT14TTR |

The M74HCT14 is designed to directly interface HSC$^2$MOS systems with TTL and NMOS components.
All inputs are equipped with protection circuits against static discharge and transient excess voltage.

### PIN CONNECTION AND IEC LOGIC SYMBOLS



## INPUT AND OUTPUT EQUIVALENT CIRCUIT




## PIN DESCRIPTION

| PIN No | SYMBOL | NAME AND FUNCTION |
|---|---|---|
| 1, 3, 5, 9, 11, 13 | 1A to 6A | Data Inputs |
| 2, 4, 6, 8, 10, 12 | 1Y to 6Y | Data Outputs |
| 7 | GND | Ground (0V) |
| 14 | $V_{CC}$ | Positive Supply Voltage |

## TRUTH TABLE

| A | Y |
|---|---|
| L | H |
| H | L |

## ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_{CC}$ | Supply Voltage | -0.5 to +7 | V |
| $V_I$ | DC Input Voltage | -0.5 to $V_{CC}$ + 0.5 | V |
| $V_O$ | DC Output Voltage | -0.5 to $V_{CC}$ + 0.5 | V |
| $I_{IK}$ | DC Input Diode Current | ± 20 | mA |
| $I_{OK}$ | DC Output Diode Current | ± 20 | mA |
| $I_O$ | DC Output Current | ± 25 | mA |
| $I_{CC}$ or $I_{GND}$ | DC $V_{CC}$ or Ground Current | ± 50 | mA |
| $P_D$ | Power Dissipation | 500(*) | mW |
| $T_{stg}$ | Storage Temperature | -65 to +150 | °C |
| $T_L$ | Lead Temperature (10 sec) | 300 | °C |

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied
(*) 500mW at 65 °C; derate to 300mW by 10mW/°C from 65°C to 85°C

## RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_{CC}$ | Supply Voltage | 4.5 to 5.5 | V |
| $V_I$ | Input Voltage | 0 to $V_{CC}$ | V |
| $V_O$ | Output Voltage | 0 to $V_{CC}$ | V |
| $T_{op}$ | Operating Temperature | -55 to 125 | °C |

## DC SPECIFICATIONS

| Symbol | Parameter | Test Condition | | Value | | | | | | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $V_{CC}$ (V) | | $T_A$ = 25°C | | | -40 to 85°C | | -55 to 125°C | | |
| | | | | Min. | Typ. | Max. | Min. | Max. | Min. | Max. | |
| $V_P$ | High Level Threshold Voltage | 4.5 | | 1.2 | 1.55 | 1.9 | 1.2 | 1.9 | 1.2 | 1.9 | V |
| | | 5.5 | | 1.4 | 1.75 | 2.1 | 1.4 | 2.1 | 1.4 | 2.1 | |
| $V_N$ | Low Level Threshold Voltage | 4.5 | | 0.5 | 0.85 | 1.2 | 0.5 | 1.2 | 0.5 | 1.2 | V |
| | | 5.5 | | 0.6 | 1.1 | 1.4 | 0.6 | 1.4 | 0.6 | 1.4 | |
| $V_H$ | Hysteresis Voltage | 4.5 | | 0.4 | 0.7 | 1.4 | 0.4 | 1.4 | 0.4 | 1.4 | V |
| | | 5.5 | | 0.4 | 0.7 | 1.5 | 0.4 | 1.5 | 0.4 | 1.5 | |
| $V_{OH}$ | High Level Output Voltage | 4.5 | $I_O$=-20 µA | 4.4 | 4.5 | | 4.4 | | 4.4 | | V |
| | | | $I_O$=-4.0 mA | 4.18 | 4.31 | | 4.13 | | 4.10 | | |
| $V_{OL}$ | Low Level Output Voltage | 4.5 | $I_O$=20 µA | | 0.0 | 0.1 | | 0.1 | | 0.1 | V |
| | | | $I_O$=4.0 mA | | 0.17 | 0.26 | | 0.33 | | 0.40 | |
| $I_I$ | Input Leakage Current | 5.5 | $V_I = V_{CC}$ or GND | | | ± 0.1 | | ± 1 | | ± 1 | µA |
| $I_{CC}$ | Quiescent Supply Current | 5.5 | $V_I = V_{CC}$ or GND | | | 1 | | 10 | | 20 | µA |

## AC ELECTRICAL CHARACTERISTICS ($C_L$ = 50 pF, Input $t_r = t_f$ = 6ns)

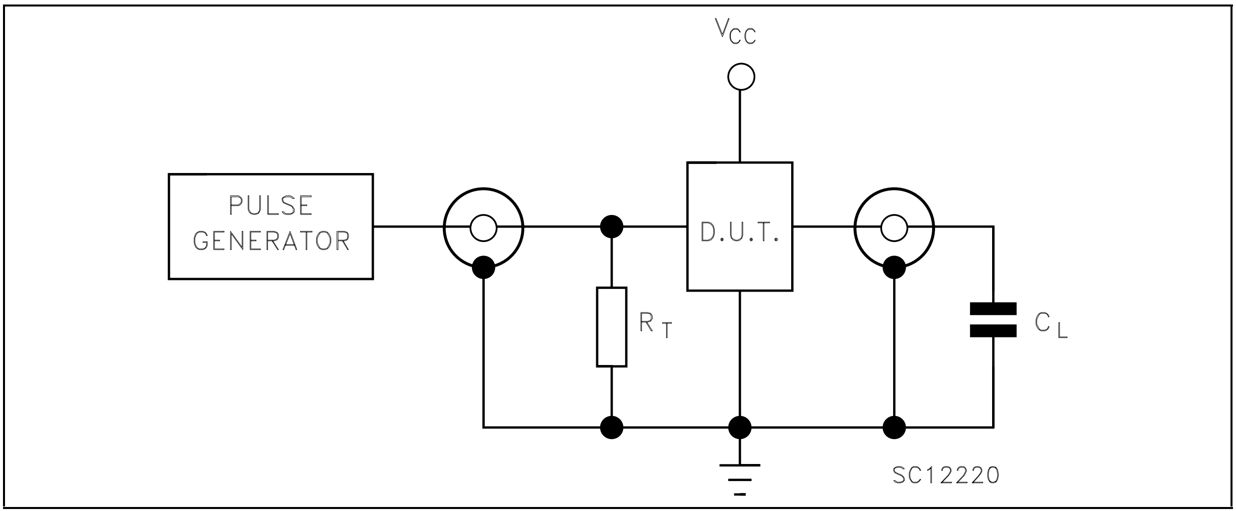
| Symbol | Parameter | Test Condition | | Value | | | | | | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $V_{CC}$ (V) | | $T_A$ = 25°C | | | -40 to 85°C | | -55 to 125°C | | |
| | | | | Min. | Typ. | Max. | Min. | Max. | Min. | Max. | |
| $t_{TLH}$ $t_{THL}$ | Output Transition Time | 4.5 | | | 8 | 15 | | 19 | | 22 | ns |
| $t_{PLH}$ $t_{PHL}$ | Propagation Delay Time | 4.5 | | | 19 | 30 | | 38 | | 45 | ns |

## CAPACITIVE CHARACTERISTICS

| Symbol | Parameter | Test Condition | | Value | | | | | | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $V_{CC}$ (V) | | $T_A$ = 25°C | | | -40 to 85°C | | -55 to 125°C | | |
| | | | | Min. | Typ. | Max. | Min. | Max. | Min. | Max. | |
| $C_{IN}$ | Input Capacitance | | | | 5 | 10 | | 10 | | 10 | pF |
| $C_{PD}$ | Power Dissipation Capacitance (note 1) | | | | 45 | | | | | | pF |

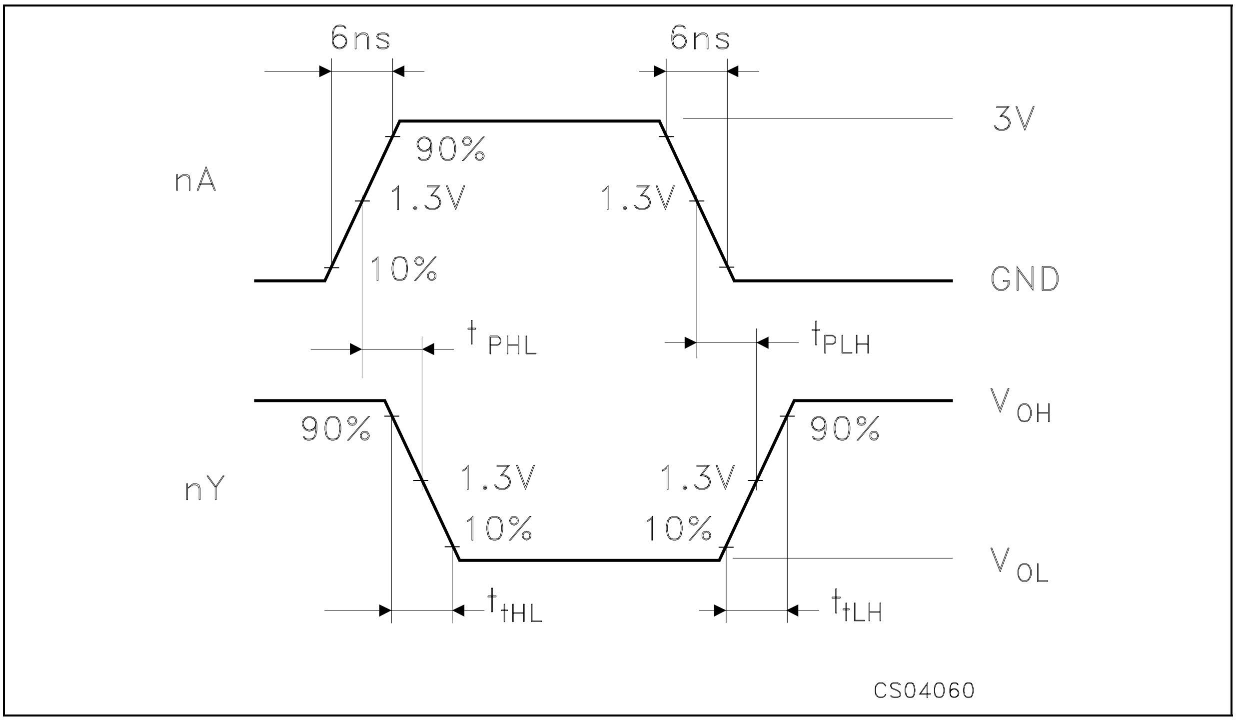
1) $C_{PD}$ is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average operating current can be obtained by the following equation. $I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}$

**TEST CIRCUIT**



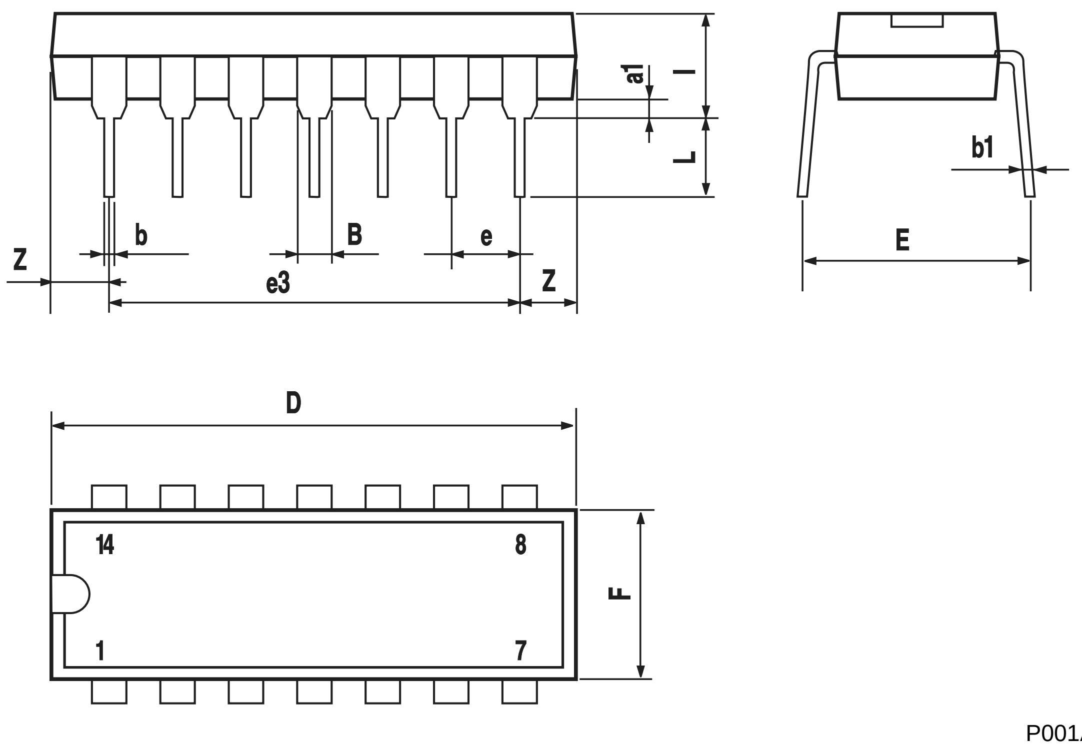

$C_L$ = 50pF or equivalent (includes jig and probe capacitance)
$R_T$ = $Z_{OUT}$ of pulse generator (typically 50Ω)

**WAVEFORM 1: PROPAGATION DELAY TIMES** (f=1MHz; 50% duty cycle)



## Plastic DIP-14 MECHANICAL DATA

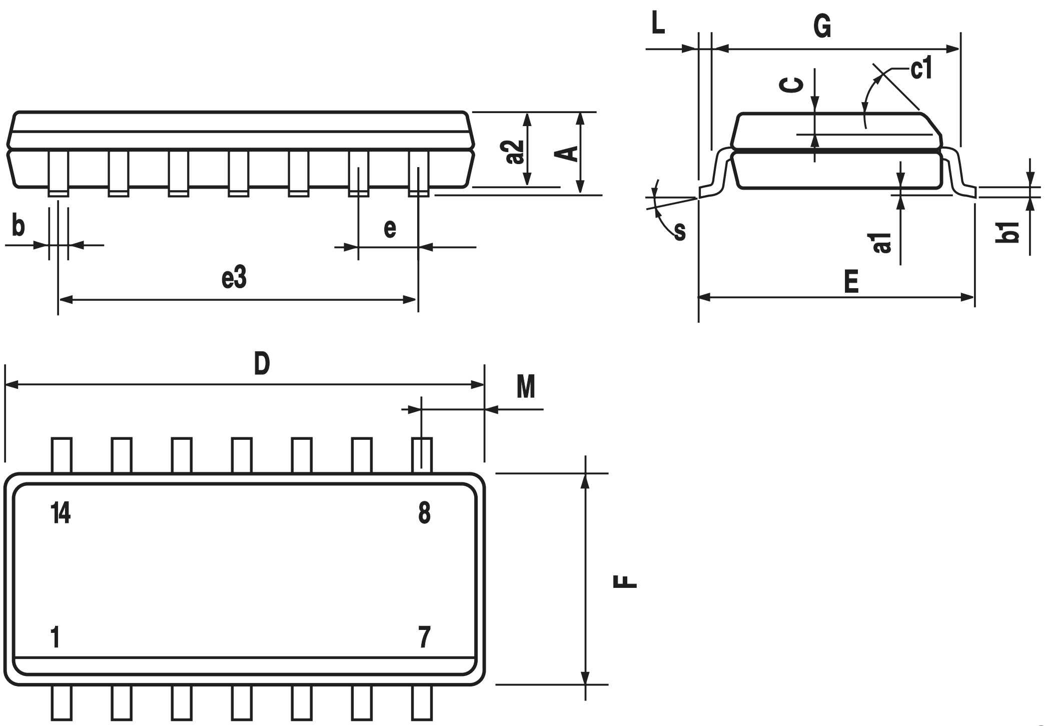
| DIM. | mm. | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| a1 | 0.51 | | | 0.020 | | |
| B | 1.39 | | 1.65 | 0.055 | | 0.065 |
| b | | 0.5 | | | 0.020 | |
| b1 | | 0.25 | | | 0.010 | |
| D | | | 20 | | | 0.787 |
| E | | 8.5 | | | 0.335 | |
| e | | 2.54 | | | 0.100 | |
| e3 | | 15.24 | | | 0.600 | |
| F | | | 7.1 | | | 0.280 |
| I | | | 5.1 | | | 0.201 |
| L | | 3.3 | | | 0.130 | |
| Z | 1.27 | | 2.54 | 0.050 | | 0.100 |




P001A

## SO-14 MECHANICAL DATA

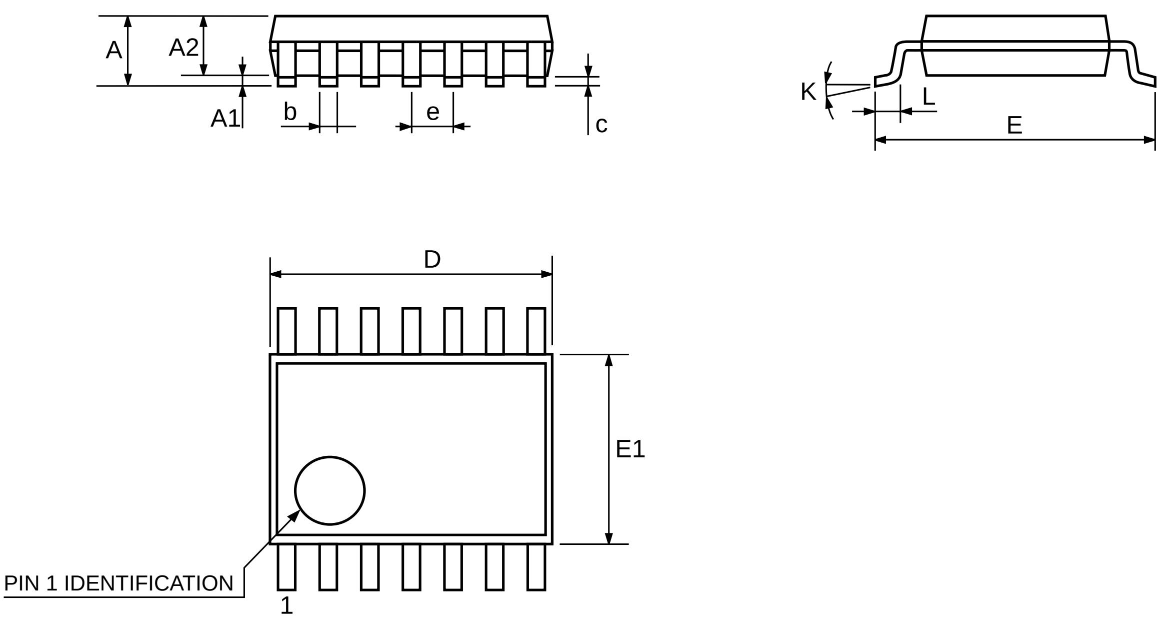
| DIM. | mm. | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | | | 1.75 | | | 0.068 |
| a1 | 0.1 | | 0.2 | 0.003 | | 0.007 |
| a2 | | | 1.65 | | | 0.064 |
| b | 0.35 | | 0.46 | 0.013 | | 0.018 |
| b1 | 0.19 | | 0.25 | 0.007 | | 0.010 |
| C | | 0.5 | | | 0.019 | |
| c1 | 45° (typ.) | | | | | |
| D | 8.55 | | 8.75 | 0.336 | | 0.344 |
| E | 5.8 | | 6.2 | 0.228 | | 0.244 |
| e | | 1.27 | | | 0.050 | |
| e3 | | 7.62 | | | 0.300 | |
| F | 3.8 | | 4.0 | 0.149 | | 0.157 |
| G | 4.6 | | 5.3 | 0.181 | | 0.208 |
| L | 0.5 | | 1.27 | 0.019 | | 0.050 |
| M | | | 0.68 | | | 0.026 |
| S | 8° (max.) | | | | | |




PO13G

## TSSOP14 MECHANICAL DATA

| DIM. | mm. | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | | | 1.2 | | | 0.047 |
| A1 | 0.05 | | 0.15 | 0.002 | 0.004 | 0.006 |
| A2 | 0.8 | 1 | 1.05 | 0.031 | 0.039 | 0.041 |
| b | 0.19 | | 0.30 | 0.007 | | 0.012 |
| c | 0.09 | | 0.20 | 0.004 | | 0.0089 |
| D | 4.9 | 5 | 5.1 | 0.193 | 0.197 | 0.201 |
| E | 6.2 | 6.4 | 6.6 | 0.244 | 0.252 | 0.260 |
| E1 | 4.3 | 4.4 | 4.48 | 0.169 | 0.173 | 0.176 |
| e | | 0.65 BSC | | | 0.0256 BSC | |
| K | 0° | | 8° | 0° | | 8° |
| L | 0.45 | 0.60 | 0.75 | 0.018 | 0.024 | 0.030 |




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